CLAIMS

1. A method of preventing or treating coeliac disease comprising administering to an individual at least one agent selected from:

(a) a peptide comprising at least one epitope comprising a sequence selected from the group consisting of SEQ ID NOs:18-22, 31-36, 39-44, and 46, and equivalents thereof; and

(b) an analogue of (a) which is capable of being recognised by a T cell receptor that recognises the peptide of (a) and which is not more than 50 amino acids in length; and

(c) optionally, in addition to the agent selected from (a) and (b), a peptide comprising at least one epitope comprising a sequence selected from SEQ ID NO:1 and SEQ ID NO:2.

2. A method of claim 1 wherein the agent is HLA-DQ2-restricted.

3. A method of claim 1 wherein the agent is HLA-DQ8-restricted.

4. A method of claim 1 wherein one agent is HLA-DQ2-restricted and a second agent is HLA-DQ8-restricted.

5. A method of claim 1 wherein the agent comprises a wheat epitope.

6. A method of claim 1 wherein one agent comprises a wheat epitope and one agent comprises a rye epitope.

7. A method of claim 1 wherein one agent comprises a wheat epitope and one agent comprises a barley epitope.

8. A method of claim 1 wherein one agent comprises a rye epitope and one agent comprises a barley epitope.

9. A method of claim 1 wherein one agent comprises a wheat epitope, one agent comprises a barley epitope, and one agent comprises a rye epitope.

10. A method of claim 1 wherein a single agent comprises a wheat epitope, a barley epitope, and a rye epitope.

11. A method of preventing or treating coeliac disease comprising administering to an individual a pharmaceutical composition comprising an agent as defined in claim 1 and a pharmaceutically acceptable carrier or diluent.

12. A method of preventing or treating coeliac disease comprising administering to an individual a pharmaceutical composition comprising an antagonist of a T cell which has a T cell receptor as defined in claim 1, and a pharmaceutically acceptable carrier or diluent.

13. A method of preventing or treating coeliac disease comprising administering to an individual a composition for tolerising an individual to a gliadin protein to suppress the production of a T cell or antibody response to an agent as defined in claim 1, which composition comprises an agent as defined in claim 1.

14. A method of preventing or treating coeliac disease comprising:

diagnosing coeliac disease in an individual by either:

a) contacting a sample from the host with at least one agent selected from:

i) a peptide comprising at least one epitope comprising a sequence selected from the group consisting of: SEQ ID NOS:18-22, 31-36, 39-44, and 46, and equivalents thereof; and

ii) an analogue of i) which is capable of being recognised by a T cell receptor that recognises i) and which is not more than 50 amino acids in length; and

iii) optionally, in addition to the agent selected from i) and ii), a peptide comprising at least one epitope comprising a sequence selected from SEQ ID NOS:1 and 2; and

determining *in vitro* whether T cells in the sample recognise the agent; recognition by the T cells indicating that the individual has, or is susceptible to, coeliac disease; or

b) administering an agent as defined in claim 1 and determining *in vivo* whether T cells in the individual recognise the agent, recognition of the agent indicating that the individual has or is susceptible to coeliac disease; and

administering to an individual diagnosed as having, or being susceptible to, coeliac disease a therapeutic agent for preventing or treating coeliac disease.

15. Use of an agent for the preparation of a medicament for treating or preventing coeliac disease, wherein the agent comprises:

(a) a peptide comprising at least one epitope comprising a sequence selected from the group consisting of SEQ ID NOs:18-22, 31-36, 39-44, and 46, and equivalents thereof; and

(b) an analogue of (a) which is capable of being recognised by a T cell receptor that recognises the peptide of (a) and which is not more than 50 amino acids in length; and

(c) optionally, in addition to the agent selected from (a) and (b), a peptide comprising at least one epitope comprising a sequence selected from SEQ ID NO:1 and SEQ ID NO:2.

16. A use of claim 15 wherein the agent is HLA-DQ2-restricted.

17. A use of claim 15 wherein the agent is HLA-DQ8-restricted.

18. A use of claim 15 wherein one agent is HLA-DQ2-restricted and a second agent is HLA-DQ8-restricted.

19. A use of claim 15 wherein the agent comprises a wheat epitope.

20. A use of claim 15 wherein one agent comprises a wheat epitope and one agent comprises a rye epitope.

21. A use of claim 15 wherein one agent comprises a wheat epitope and one agent comprises a barley epitope.

22. A use of claim 15 wherein one agent comprises a rye epitope and one agent comprises a barley epitope.

23. A use of claim 15 wherein one agent comprises a wheat epitope, one agent comprises a barley epitope, and one agent comprises a rye epitope.

24. A use of claim 15 wherein a single agent comprises a wheat epitope, a barley epitope, and a rye epitope.

25. A use of claim 15 wherein the agent is present within a pharmaceutical composition comprising a pharmaceutically acceptable carrier or diluent.

26. A use of claim 15 wherein the agent is present within a pharmaceutical composition comprising an antagonist of a T cell which has a T cell receptor as defined in claim 15, and a pharmaceutically acceptable carrier or diluent.

27. A use of claim 15 wherein the agent is present within a composition for tolerising an individual to a gliadin protein to suppress the production of a T cell or antibody response to an agent as defined in claim 1.

28. An agent as defined in claim 1, optionally in association with a carrier, for use in a method of treating or preventing coeliac disease by tolerising T cells which recognise the agent.

29. An antagonist of a T cell which has a T cell receptor as defined in claim 1, optionally in association with a carrier, for use in a method of treating or preventing coeliac disease by antagonising such T cells.

30. An agent as defined in claim 1 or an analogue that binds an antibody that binds to an epitope of an agent as defined in claim 1 for use in a method of treating or preventing coeliac disease in an individual by tolerising the individual to prevent the production of such an antibody.

31. A protein that comprises a sequence which is able to bind to a T cell receptor, which T cell receptor recognises an agent as defined in claim 1, and which sequence is able to cause antagonism of a T cell that carries such a T cell receptor.

32. An agent as defined in claim 1 or an antagonist as defined in claim 12.

33. A pharmaceutical composition comprising an agent as defined in claim 1 or an antagonist as defined in claim 12 and a pharmaceutically acceptable carrier or diluent.

34. A composition for tolerising an individual to a gliadin protein to suppress the production of a T cell or antibody response to an agent as defined in claim 1, which composition comprises an agent as defined in claim 1.

35. A composition for antagonising a T cell response to an agent as defined in claim 1, which composition comprises an antagonist as defined in claim 12.

36. A mutant gliadin protein whose wild-type sequence can be modified by a transglutaminase to a sequence which is an agent as defined in claim 1, which mutant gliadin protein comprises a mutation which prevents its modification by a transglutaminase to a sequence which is an agent as defined in claim 1; or a fragment of such a mutant gliadin protein which is at least 15 amino acids long and which comprises the mutation.

37. A polynucleotide that comprises a coding sequence that encodes a protein or fragment as defined in claim 36 or 31.

38. A polynucleotide according to claim 37 that additionally comprises one or more regulatory sequences operably linked to the coding sequence, which regulatory sequences are capable of securing the expression of the coding sequence in a cell.

39. A polynucleotide according to claim 38 wherein the regulatory sequence(s) allow expression of the coding sequence in a prokaryotic or mammalian cell.

40. A polynucleotide according to any one of claims 37 to 39 which is a vector or which is in the form of a vector.

41. A cell comprising a polynucleotide as defined in any one of claims 37 to 40 or which has been transformed with such a polynucleotide.

42. A cell according to claim 41 which is a prokaryotic cell or a mammalian cell.

43. A mammal that expresses a T cell receptor as defined in claim 1.

44. A method of diagnosing coeliac disease, or susceptibility to coeliac disease, in an individual comprising:

(a) contacting a sample from the host with at least one agent selected from

(i) a peptide comprising at least one epitope comprising a sequence selected from the group consisting of: SEQ ID NOS:18-22, 31-36, 39-44, and 46, and equivalents thereof; and

(ii) an analogue of (i) which is capable of being recognised by a T cell receptor that recognises (i) and which is not more than 50 amino acids in length; and

(iii) optionally, in addition to the agent selected from (i) and (ii), a peptide comprising at least one epitope comprising a sequence selected from SEQ ID NOS:1 and 2; and

(b) determining *in vitro* whether T cells in the sample recognise the agent; recognition by the T cells indicating that the individual has, or is susceptible to, coeliac disease.

45. Use of an agent as defined in claim 44 for the preparation of a diagnostic means for use in a method of diagnosing coeliac disease, or susceptibility to coeliac disease, in an individual, said method comprising determining whether T cells of the individual recognise the agent, recognition by the T cells indicating that the individual has, or is susceptible to, coeliac disease.

46. A method or use according to claim 44 or 45 wherein the agent is an analogue (iii) which comprises (i) or (ii) bound to (a) an HLA molecule, or (b) a fragment of an HLA molecule capable of binding (i) or (ii).

47. A method or use according to claim 46 wherein the HLA molecule or fragment is in a complex comprising four HLA molecules or fragments of HLA molecules.

48. Use according to claim 45, 46 or 47 wherein the method comprises administering the agent to the skin of an individual and detecting the presence of inflammation at the site of administration, the detection of inflammation indicating that the T cells of the individual recognise the agent.

49. A method according to claim 44, 46 or 47 wherein the sample is blood sample.

50. A method according to claim 44, 46, 47 or 49 wherein the T cells are not restimulated in antigen specific manner *in vitro* before the said determining.

51. A method or use according to any one claims 44-50 in which the recognition of the agent by the T cells is determined by detecting the secretion of a cytokine from the T cells.

52. A method or use according to claim 51 in which the cytokine is IFN-γ.

53. A method or use according to claim 51 or claim 52 in which the cytokine is detected by allowing the cytokine to bind to an immobilised antibody specific to the cytokine and then detecting the presence of the antibody/cytokine complex.

54. A method or use according to any one of claims 44 to 50 wherein said determining is done by measuring whether the agent binds the T cell receptor.

55. A method for identifying an analogue as defined in a claim 44, 46 or 47 comprising determining whether a candidate substance is recognised by a T cell receptor that recognises an epitope comprising sequence as defined in claim 44, recognition of the substance indicating that the substance is an analogue.

56. A method of diagnosing coeliac disease, or susceptibility to coeliac disease, in an individual comprising determining the presence of an antibody that binds to an epitope of an epitope comprising sequence as defined in claim 44 in a sample from the individual, the presence of the antibody indicating that the individual has, or is susceptible to, coeliac disease.

57. A method of determining whether a composition is capable of causing coeliac disease comprising determining whether a protein capable of being modified by a transglutaminase to an oligopeptide sequence as defined in claim 44 is present in the composition, the presence of the protein indicating that the composition is capable of causing coeliac disease.

58. A method according to claim 57 wherein the said determining is done by contacting the composition with an antibody specific for the sequence which is capable of being modified to the oligopeptide sequence, binding of the antibody to a protein in the composition indicating the composition is capable of causing coeliac disease.

59. A method of identifying an antagonist of a T cell, which T cell recognises an agent as defined in claim 1, comprising contacting a candidate substance with the T cell and detecting whether the substance causes a decrease in the ability of the T cell to undergo an antigen specific response, the detecting of any such decrease in said ability indicating that the substance is an antagonist.

60. A kit for carrying out a method or use according to any one of claims 44 to 54 comprising an agent as defined in claim 44, 46 or 47 and a means to detect the recognition of the peptide by the T cell.

61. A kit according to claim 60 wherein the means to detect recognition comprises an antibody to IFN-γ.

62. A kit according to claim 61 wherein the antibody is immobilised on a solid support and optionally the kit also comprises a means to detect the antibody/IFN-γ complex.

63. Use of an agent or antagonist as defined in claim 62 or a wild type sequence as defined in claim 36 to produce an antibody specific to the agent, antagonist or wild type sequence.

64. Use of a mutation in an epitope of a gliadin protein, which epitope is as defined in claim 44, to decrease the ability of the gliadin protein to cause coeliac disease.

65. Method of identifying a product which is therapeutic for coeliac disease comprising administering a candidate substance to a mammal as defined in claim 43 which has, or which is susceptible to, coeliac disease and determining whether substance prevents or treats coeliac disease in the mammal, the prevention or treatment of coeliac disease indicating that the substance is a therapeutic product.

66. A therapeutic product as identified in the method of claim 65 for use in a method of preventing or treating coeliac disease.

67. A method of diagnosing coeliac disease, or susceptibility to coeliac disease in an individual comprising administering an agent as defined in claim 44 and determining *in vivo* whether T cells in the individual recognise the agent, recognition of the agent indicating that the individual has or is susceptible to coeliac disease.

68. A cell according to claim 41 which is a cell of a graminaceous monocotyledonous species.

69. A cell according to claim 68 which is a cell of wheat, maize, oats, rye, rice, barley, triticale, sorghum, or sugar cane.

70. A process for the production of a protein encoded by a coding sequence as defined in claim 37 which process comprises:

(a) cultivating a cell according to any one of claims 41, 42, 68 or 69 under conditions that allow the expression of the protein; and optionally

(b) recovering the expressed protein.

71. A method of obtaining a transgenic plant cell comprising:

(a) transforming a plant cell with a vector according to claim 40 to give a transgenic plant cell.

72. A method of obtaining a first-generation transgenic plant comprising:

(b) regenerating a transgenic plant cell transformed with a vector according to claim 40 to give a transgenic plant.

73. A method of obtaining a transgenic plant seed comprising:

(c) obtaining a transgenic seed from a transgenic plant obtainable by step (b) of claim 72.

74. A method of obtaining a transgenic progeny plant comprising obtaining a second-generation transgenic progeny plant from a first-generation transgenic plant obtainable by a method according to claim 72, and optionally obtaining transgenic plants of one or more further generations from the second-generation progeny plant thus obtained.

75. A method according to claim 74 comprising:

(d) obtaining a transgenic seed from a first-generation transgenic plant obtainable by the method according to claim 73, then obtaining a second-generation transgenic progeny plant from the transgenic seed;

and/or

(e) propagating clonally a first-generation transgenic plant obtainable by the method according to claim 72 to give a second-generation progeny plant;

and/or

(f) crossing a first-generation transgenic plant obtainable by a method according to claim 72 with another plant to give a second-generation progeny plant;

and optionally

(g) obtaining transgenic progeny plants of one or more further generations from the second-generation progeny plant thus obtained.

76. A transgenic plant cell, plant, plant seed or progeny plant obtainable by a method according to any one of claims 71 to 75.

77. A transgenic plant or plant seed comprising plant cells according to claim 68 or 69.

78. A transgenic plant cell callus comprising plant cells according to claim 68 or 69 obtainable from a transgenic plant cell, first-generation plant, plant seed or progeny as defined in any one of claims 68, 69, or 71 to 75.

79. A plant or callus according to any one of claims claim 76 to 78 which is of a species as defined in claim 68 or 69.

80. A method of obtaining a crop product comprising harvesting a crop product from a plant according to any one of claims 76 to 79 and optionally further processing the harvested product.

81. A method according to claim 80 wherein the plant is a wheat plant and the harvested crop product is grain; optionally further processed into flour or another grain product.

82. A crop product obtainable by a method according to claim 80 or 81.

83. A food that comprises a protein as defined in any claim 31 or 36.

84. A food according to claim 83 in which a protein as defined in claim 31 or 36 is used instead of wild-type gliadin.